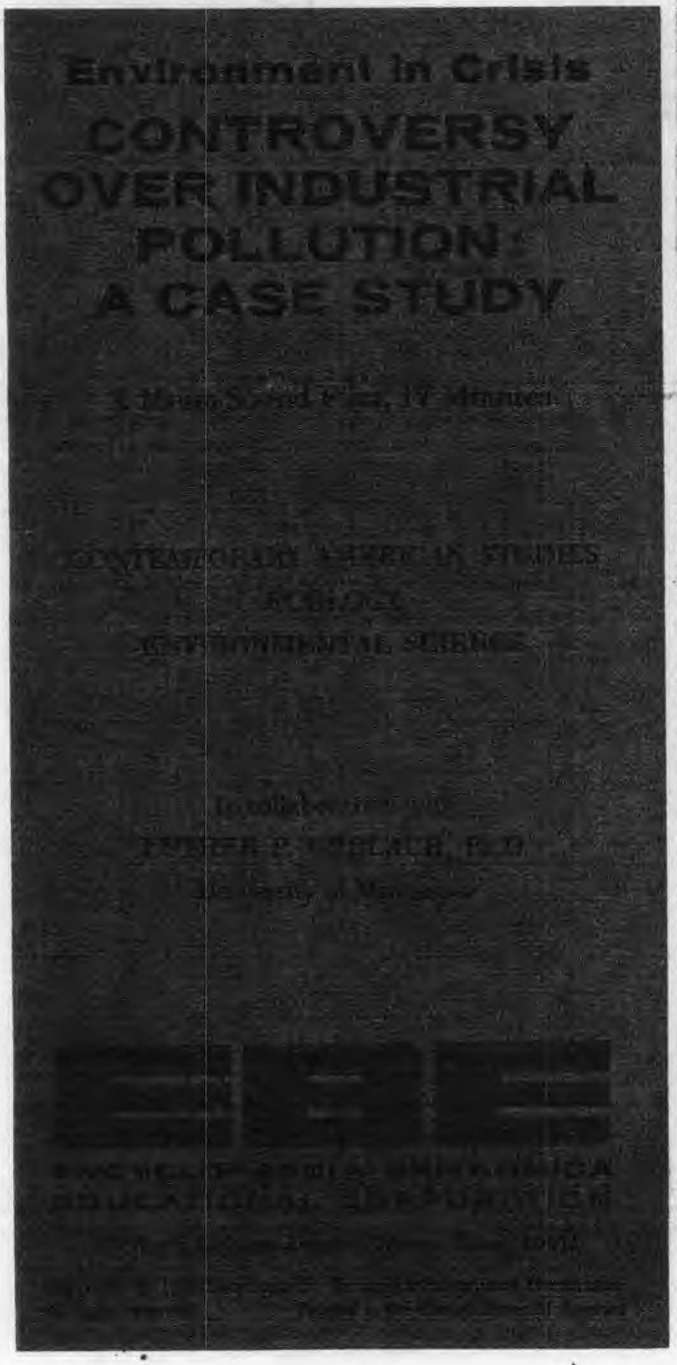

PURPOSE OF THE FILM

This film examines the multitude of scientific, social, and economic issues involved in a specific environmental problem. Because it is a case study of a particular pollution controversy, it gives tangible form to the variety of questions that have risen out of the ecology movement. The film thus serves as a basis for discussion of the environmental crisis in general and, most importantly, of the lessons the crisis teaches about the nature of social change.

ABOUT THE CONTROVERSY

Columbia Falls is a small town of about three thousand in northwestern Montana, about fifty miles south of the Canadian border. Until the middle of the twentieth century, Columbia Falls was an economically depressed area. There was little employment, and the business that did exist there—lumbering and a small amount of tourist trade—was seasonal.

In the 1950s an aluminum reduction plant was built in Columbia Falls. The town was chosen because of its proximity to Hungry Horse Dam, a major source of the electrical power vital to the aluminum manufacturing process. With the arrival of the aluminum industry, Columbia Falls experienced significant economic growth—population increased, property values went up, the tax base was broadened, and there was a year-round source of employment. By 1972 the Anaconda Aluminum Company plant employed about nine hundred people, and about half of these people lived in Columbia Falls, with the rest scattered in nearby towns.

In 1968 the company expanded its Columbia Falls operation. As a result of this expansion, a great deal of fluoride began to escape into the surrounding area. Soon it became evident that the emissions were injuring certain plants. Damage was reported from as far away as Glacier National Park, about six miles from Columbia Falls. Studies were undertaken—by the Anaconda Company, the Forest Service, the University of Montana, and the National Air Pollution Control Administration—to determine how far the fluorides traveled and how they affected the environment. Lawsuits were filed against the Anaconda Company. When this film was made, the suits were still being argued in the courts.

In the meantime, public pressure had led to the establishment of a fluoride emission standard for the state of Montana, scheduled to go into effect in 1973. Although the company had succeeded in significantly reducing its fluoride emissions—from about 7,500 pounds per day in 1970 to less than 2,000 pounds in 1972—

Anaconda requested a one-year variance from the state standard to allow the company more time to get down to the required 864-pound-per-day level.

Controversy over Industrial Pollution catches the Columbia Falls controversy at a specific stage in its development. The film outlines the problems and shows the opposing viewpoints, the questions that have to be asked, and the reactions of people involved in a dilemma that more and more of us are facing each day.

SUGGESTIONS FOR USING THE FILM

Controversy over Industrial Pollution is designed to stimulate classroom discussion on several levels. For this reason it is suggested that the teacher preview the film in order to appropriately guide the discussion. Initial discussion may center on the Columbia Falls controversy and the specific issues relevant to it (see questions 1–5 below). For this purpose the film can be interrupted at two points to allow students to review and clarify the material presented. After seeing the whole film, students can continue the discussion until all the issues of the case are clearly understood. The continuity provided in this guide will be useful for reviewing these concepts and the positions taken by the people shown in the film.

When the class has thoroughly examined the case study, discussion may proceed to a second level—an examination of the national pollution problem and its relationship to technology, the profit motive, and the process of social change (questions 6–10).

Finally, the film will lend itself to a consideration of some wider issues, such as the uses of symbolism in modern society and the causes and effects of movements for social change (questions 11–12). To initiate a discussion of this sort, it may be helpful to screen the film a second time—without interruptions this time—after making students aware of the topics that will be discussed.

QUESTIONS FOR DISCUSSION

1. What are the benefits to Columbia Falls of the Anaconda aluminum plant's presence there? Do the benefits extend beyond the immediate community? What would happen if the plant were forced to close down? Would anyone outside the Columbia Falls community be affected? Who? How would they be affected?

2. Explain the direct and indirect dangers that result from the emission of fluorides in the Columbia Falls area. What may happen if the plant is allowed to continue operations? What effect would this have outside of the Columbia Falls area?

3. How is it possible that the two independent scientific studies produced two different conclusions? Which conclusion do you believe? Why?

4. What do you think should be done if Anaconda cannot sufficiently decrease fluoride emissions? How would you expect an aluminum worker to answer this question? A farmer? A physician? An economist? A politician? How do the social roles of the people in the film relate to the conclusions they make about the pollution problem?

5. What kinds of aluminum products do you buy? Does your purchase of aluminum make you a part of the Columbia Falls problem? If you were forced to make a choice between having these products and having a pollution-free environment, which would you choose? Are these the only alternatives?

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6. The ecology movement marks the emergence of a new awareness and a challenge to the traditional economic values of growth and prosperity. To what extent are these values still valid? Are growth and prosperity incompatible with a clean environment? How did the new awareness develop?

7. Many people believe that we can rely on technology to solve the pollution problem. Do you believe this is true? If so, how can technology be turned toward this end?

8. If technology is not able to solve the problem, what should be done? Are there any nontechnological solutions? What are they? How will they come about? How will they affect us?

9. The farmer in the film was concerned about the pollution problem because it affected the productivity of his cows and, thus, the efficiency of his farm. This is one instance in which the profit motive supports ecological concerns. Are there other such instances? How can the profit motive be used to increase concern for the environment? Is this a satisfactory approach to the situation? Note that the farmer's profit motive conflicts with that of the aluminum company. Whose profits are more important? How can this question be decided, and who should decide it?

10. Unless a technological solution is found, Columbia Falls will be faced with an unfortunate choice between giving up the aluminum plant and ecological deterioration. What does this say about our traditional approaches to planning and problem solving? What kind of planning is necessary to avoid this kind of situation in the future?

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11. Smokestacks are used in the film as symbols of both economic progress and ecological disaster. How can the smokestacks symbolize completely different things? What are some other symbols we use in our political, economic, and social lives (for example, the flag, big cars, long hair)? How do we use these sym-

bols? What makes them useful? Can they be misleading? How can they be dangerous? What precautions should we take when using symbols? Dr. Luther Gerlach (EBE's collaborator on this film) suggests that we often fight our social battles on a symbolic level. For example, we may use the way we dress or the way we treat the flag as symbolic protests, rather than taking our protests to the streets. Do you think this is true? Is this a valid way of registering protest? Does it work?

12. The film suggests in several places that in order to overcome the pollution problem we will have to question and change some of our basic, traditionally held beliefs. What is it like to be forced to change a long-accepted way of life? How would you react if one of your strong beliefs was suddenly shown to be invalid? Imagine a specific situation and explain the pressures you would be subject to.

ACTIVITIES FOR CLASS PARTICIPATION

1. When *Controversy over Industrial Pollution* was made, the lawsuits against the Anaconda Company had not yet come to trial. The state fluoride emission standard had not yet gone into effect, and it had not been decided whether or not Anaconda would receive its requested variance from this standard. Follow the development of the controversy, using the sources listed below.

Director of Public Relations
Anaconda Aluminum Company
Columbia Falls, Montana 59912

U.S. Department of Agriculture Forest Service
Missoula, Montana 59801

2. Select a local environmental issue and invite people representing all sides of the question to speak to the class about the controversy. Speakers might include industry spokesmen, concerned citizens' groups, government officials, and environmental scientists. Pay special attention to the way in which each individual's social role relates to the stand he takes on the issue. After all sides have been heard, discuss the issue and select a committee to condense the opinions and suggestions of class members into a report to be sent to the speakers who visited the class.

3. As a class project, discuss and act upon the question, What can we do to raise the ecological consciousness of our community?

4. Collect specific examples of symbols as they are used in newspapers, magazines, and television. What reactions are these symbols designed to arouse? Invent situations that could reverse the meanings of these symbols in the way that the meaning of the smokestack has been reversed in recent years.

RELATED EBE MATERIALS

16mm Films

THE AGING OF LAKES
THE GARBAGE EXPLOSION
The House of Man, Part I: OUR CHANGING ENVIRONMENT
The House of Man, Part II: OUR CROWDED ENVIRONMENT
NOISE: POLLUTING THE ENVIRONMENT
POPULATION ECOLOGY
Problems of Conservation: AIR
Problems of Conservation: FOREST AND RANGE
Problems of Conservation: MINERALS
Problems of Conservation: OUR NATURAL RESOURCES
Problems of Conservation: SOIL
Problems of Conservation: WATER
Problems of Conservation: WILDLIFE
WHAT IS ECOLOGY?

Filmstrips

CONSERVING OUR NATURAL RESOURCES (series of 7)
ECOLOGY: UNDERSTANDING THE CRISIS (series of 6)

FILM CONTINUITY

Leader—5'*

EBE logo—9'

Text frames: "This film will fade to black in two places to allow you to stop the projector for discussion." —18'

1. Smokestacks; factories; polluted water; aerial view of Columbia Falls, Montana—51'

NARRATOR: Not so many years ago we used to think of smokestacks as symbols of progress. They meant jobs, economic growth, the good life. But now we're beginning to question these symbols. We've become aware that we're paying a high price for progress—in the pollution of our environment. And gradually more and more people seem to recognize that we have to clean up. But how? This is Columbia Falls, Montana, a town that had to find a way to solve a serious pollution problem. That's why we've made this town, and its problem, the subject of a case study. This case study will help us understand many of the

*To order replacement footage for damaged portions of film, refer to the sequence numbers and 16mm footage in this continuity. Example of footage order: *CONTROVERSY OVER INDUSTRIAL POLLUTION: A CASE STUDY*, sequences 3 through 5; after the 77' point (end of sequence 2) print the next 89 feet.

issues we all may have to face as we work to save our endangered environment.

Titles and credits—59'

2. *Road sign; streets; lumberyard; cattle grazing; aerial view of Anaconda aluminum plant—77'*

Columbia Falls is a small town near the Canadian border. There's a thriving lumber industry here, some cattle ranching, and an aluminum production plant operated by the Anaconda Aluminum Company. Since it was built in the 1950s, the plant's been a major factor in the lives of the people who live and work in Columbia Falls.

3. *Employees punching timecards; employee distributing payroll checks; residential street; shopping center; shoppers in stores; school playground; men standing inside foundation of new house; residential street; men walking down street—103'*

HOWARD AUSTIN: The local plant has approximately 940 employees and an annual payroll in excess of 8½ million dollars. Our town has had a significant growth. New schools, new plants, of course, and our business district has expanded proportionately. The plant has pretty well made our town.

JEAN CUMMING: It not only is the tremendous payroll, it's the tax system that supports our schools and things like that.

ELDON CLARE: The town has doubled its size. The property has increased in value, I would say, five to ten times. Without the plant being here, I wouldn't be here.

4. *John Bartlett filling prescription; Jean Cumming speaking in living room; pollutants over town—135'*

BARTLETT: I, as a merchant, was tickled to death when the aluminum plant came, and found out that there's eight hundred and some over there on the payroll who are going to spend money through my cash register.

CUMMING: Well, when Anaconda first came here many years ago, we were utterly delighted. And then along about 1969 a few of us felt that what had been a blessing had turned out to be a Trojan horse. The problem became general and visibly obvious that something was sadly wrong around here. And various experts came in to look us over, and they all agreed we had a problem.

NARRATOR: The problem is that in producing aluminum the plant also emits fluorides. And fluorides are potent poisons when present in high enough concentrations. Now, why fluorides? The answer lies in how aluminum must be made.

5. *Pot room of aluminum plant; scenes showing production of aluminum; fluoride gases escaping through pot room roofs—166'*

The process of making aluminum takes place here, in these pot rooms. The plant has five of them. First alumina, a basic raw material made up of aluminum and oxygen, is put into these electric furnaces. To help separate the aluminum from the oxygen, other chemicals must be added. And some of these chemicals contain fluorides. From time to time the furnaces are broken open. Pure aluminum is tapped off. It's at these times that some fluoride gases escape the plant's pollution control equipment and get into the air inside the pot room. From here, the fluorides pass through the pot room roofs into the air outdoors.

6. *Aluminum plant and mountains; pollutants hanging over plant; Clint Carlson talking outside of plant; pollutants spreading over mountains, town, and forest —187'*

But where do the fluorides go, once they get out? And what do they do to the environment? Many scientists were involved in a program to answer these questions.

CARLSON: The smoke coming from the plant is composed mainly of hydrocarbons and water vapor. The fluorides, which cause injury to plants, are invisible. Generally the wind will blow from this direction towards the mountain, push the smoke against the mountain and then over the top. On this side of the mountain the fumes spread over a very large area including some small ranches, some state land, and a large area of national forest.

7. *Carlson inspecting ponderosa pine, analyzing samples in laboratory—216'*

One of the things that we, as scientists, must be concerned with is how far the pollutant is traveling and what kind of injuries it's causing to the trees. For instance, this ponderosa pine is showing acute symptoms of fluorosis, evident by the dead needle tips, and the shortened needles—as you see in this area—and the dead terminals. About one-half the foliage on this tree is missing, indicating that the tree no way can produce the carbohydrates it needs to survive for a long time. We also do a chemical analysis of the samples that we bring into the lab. This tells us exactly how much fluorine is in a particular sample. Knowing how much fluoride the samples contain, and then knowing where the samples came from, we can determine the distribution of fluorides in the environment in that area.

8. *Mountains and aluminum plant; various injured trees; William Janson checking outdoor monitoring station; mountain forests; Janson cutting tree samples —246'*

We found fluorides from the aluminum plant in vegetation over about 200,000 acres. We found visible injury to plants over about 60,000 acres.

NARRATOR: Company scientists, too, have been investigating the problem intensively.

JANSON: Our emissions cause visible injury to the vegetation left standing on the mountain after a forest

fire many years ago. Most of the injury occurred while we were expanding our plant two to three years ago and is generally limited to the plant property. This company has a continuing program of monitoring plant life in this area. This program involves literally hundreds of samples.

9. Chemists analyzing samples in laboratory; Janson, Carlson inspecting trees—267'

These are analyzed by company chemists, and the results are frequently cross-checked. Our conclusion is that damage to vegetation is limited to the vicinity of the plant. In fact, most of the injury on the backside of the mountain is caused not by our emissions but by a severe infestation of insects.

CARLSON: Well, sure, there's insect injury here. In fact, about 50 percent of the injury has been caused by insects. Insects normally will attack weakened trees. And we believe that the insects are here because of the fluorides.

10. Jack Canavan speaking; forests; aluminum plant; Carlson speaking in forest; Canavan speaking; aluminum plant—296'

CANAVAN: Well, we feel, and we think that it's substantiated by our own findings, that this is not true. And I also think that anybody'd like to take the time to travel through this area and look the country over would determine in their own mind that this isn't true.

NARRATOR: So after thousands of hours and hundreds of thousands of dollars of scientific effort, this is how the situation stood.

CARLSON: There's no question in my mind that these trees are going to die, because on at least 80 percent of the trees the terminals are dead.

CANAVAN: Our findings don't substantiate that at all. We've brought in our own experts, and they disagree completely with that.

NARRATOR: But who's right? Why should scientific evidence produce such disagreement?

Black frames for projector stop—298'

11. Grasses; Dr. C. C. Gordon speaking in laboratory; deer grazing—314'

GORDON: Of those plants which accumulate fluorides, some do not show visible injury. Grasses are such a type of a plant. Also, you have garden vegetables, such as lettuce, that do not show visible injury. The animals that consume this vegetation that shows no injury will accumulate this fluoride from ingesting that type of vegetation.

12. Gordon showing normal and abnormal leg bones of deer; abnormal teeth and jawbone—340'

Here is a leg bone of a normal deer. Here you have very smooth bone tissue. Here is an abnormal bone, called a fluorotic bone. Instead of a smooth surface over the bone, you have these spines. These spines will dig into the flesh. This causes the animal to become lame, and he will have a tendency not to move around as rapidly. Fluoride accumulation also causes an abnormal change in the teeth of animals. For instance, you have a jawbone here from a deer that had accumulated excessive amounts of fluoride. This rapid wearing of the top of the teeth, here, exposes the nerves.

13. Deer grazing; Ted Rogers herding cows into pen, showing cow's diseased teeth—362'

This occurs in most all wild indigenous animals that consume the forage containing the fluorides, and it also happens to domestic animals, such as cows.

ROGERS: This cow is five years old, should be in the prime of life, and she is completely ruined as a cow. Those teeth are worn down so the nerves are showing. The cow hasn't done well the last two years. She can't eat or chew or drink too well.

14. Cows grazing; aluminum plant; Rogers speaking —382'

I have approximately twenty of my cows that show damage like this—this bad or nearly as bad. It all ties in with the last three years of this excessive flouride. Hopefully, the plant has put more scrubbers in, and we think that we detect a slight improvement on the yearlings. Their teeth didn't look as bad last spring when we went through them as the two-year-olds looked two years ago. So I have hopes.

15. Men walking down street; woman opening back of station wagon; young children playing near swings; boys playing football; girls walking down street; people bowling; workers inside plant; Bartlett filling prescription—411'

NARRATOR: Of course, people are part of the environment too. How does the pollution affect them, their health, their way of life?

GORDON: I think that the people who are in the plant, who have worked there fourteen or fifteen years, are no different than the trees. That fluoride will accumulate in those humans in that area and eventually will have an adverse effect upon them.

BARTLETT: We don't have any data right now that shows that fluoride is a general health hazard, in the quantities that are being emitted in Columbia Falls. However, people that have respiratory problems—emphysema, that type of thing—undoubtedly could be aggravated by it.

16. Aluminum plant; Mrs. H. R. Dehlbom speaking outside house—432'

DEHLBOM: Well, I was in the hospital last fall, about a year ago, and a specialist there, he told me that definitely I was suffering from fluoride poisoning and that I would have to leave the area. It's really hard to leave your home after thirty years. And we raised our family here. And now we must go.

17. Diseased cow's teeth; pine trees; aluminum plant —442'

NARRATOR: People, animals, plants—all are affected by the pollution. But what to do about it? What steps can be taken to solve an industrial pollution problem?

Black frames for projector stop—444'

18. Interior of Anaconda plant—458'

One approach to cleaning up a large source of pollution is to improve the existing facilities. Since the pollution is caused by a technological process, there may be a technological solution.

JANSON: There are some basic problems with any aluminum manufacturing process. That's why this plant has always had a system for controlling its emissions.

19. Emissions from plant being monitored; fluoride gases escaping through roof; Bartlett filling prescription; aluminum plant and surrounding area—483'

And over the past couple of years the company has spent over a million dollars to improve this system still further. We continually monitor our emissions, and we know that since we improved the system our emissions have been reduced by another two-thirds. Of course, this still leaves a certain amount of fluorides escaping through the roofs, but we are working to solve this problem.

BARTLETT: Right now Anaconda is putting out three times as much fluoride as the state standard will allow. Even when and if they do reach the standard of 864 pounds, they still will be causing fluoride damage as far away from the plant as three miles.

20. Jack Canavan, Jack Riley, Curtis Peterson, and Bing Dougherty speaking; stacks of aluminum—501'

CANAVAN: At the present time, we don't know of any technology that'll allow us to meet that standard.

RILEY: Then close it down.

PETERSON: If we're shut down? I'd either have to find other work, or if I couldn't find other work, I'd have to move. I wouldn't have no choice.

DOUGHERTY: I think as long as they try their best and do what they can, that's all you can ask of them.

CANAVAN: The thing that people have to realize is this isn't just a matter of local economics. Aluminum goes into the making of thousands of different products . . .

21. Montage of aluminum products; aluminum cans being dumped; aluminum plant; pollutants over plant —525'

. . . which everybody seems to want. And making these products, in turn, creates jobs for thousands of people elsewhere.

CARLSON: I cannot see the purpose of producing more and more aluminum every day, while at the same time we are throwing away billions of aluminum beer cans and of various other aluminum products.

NARRATOR: Clearly, we can't clean up pollution by technological means alone. We can't simply measure the problem in pounds of pollutants removed or in dollars and cents gained or lost. Still, the problem has to be evaluated somehow.

22. Gordon speaking in laboratory; forest; pine needles; pollutants over aluminum plant; workers inside plant —547'

GORDON: I think the economist has to be biologically aware of what's happening, you know, and I don't think he has in the past really realized the importance of the ecosystem. If he had, then I think that we would show that we are not gaining anything economically by dumping our garbage into the environment.

LEE SMITH: Industry can't be subjected to the demands of environmentalists only and be expected to respond as the environmentalists want them to. Industry has to survive.

23. Bridge; man fishing; forest; farmland; woman with animals; forests—570'

MRS. HAYS: People are going to have to quit using things that they don't actually need.

MRS. BELL: I think that's what's going to have to change—people's values. Maybe you're going to have to value having a few trees a little bit more than you'll value having a new car.

GORDON: It's a real problem, you know. You say, do you have an answer? Hell, no, there's no answer to this type of thing—not without a social upheaval, a complete change in our social system.

CUMMING: Well, I think it's a theological problem. We are stewards rather than despoilers of creation. It's what do you owe the earth, in the long run?

End titles and credits—586'

Producer: Charles L. Finance